MAUDLIN-VICKREY AUCTION METHOD
AND SYSTEM FOR MAXIMIZING SELLER REVENUE AND PROFIT

TECHNICAL FIELD

The present invention relates in general to auction methods, and in particular to a one

5 sided seller defined method and system for maximizing a seller's profit by withholding

supply in Vickrey auctions based on a market-derived reserve price calculated from the

buyers' bids in order to maximize revenues and/or profits to the seller(s).

BACKGROUND

An auction is a method of selling goods, based upon competition among buyers.

10 A seller wishes to obtain as much money as possible, and a buyer wants to pay as little as

necessary. What is unique about auctions as a sales method is that the price is set not by

the seller, but by the bidders. However, it is the seller who determines the parameters and

sets the rules by choosing the type of auction to be used. An auction offers the advantage

of simplicity in determining market-based prices and is efficient in the sense that it

15 usually ensures that goods are purchased by those who value them most highly and

ensures also that sellers receive the market's assessment of that value.

Not all auctions have ascending price schemes. In fact, there are many different

auction formats including the familiar ascending bid, but also including the descending,

sealed-bid, simultaneous, handshake, and whispered forms of bidding. Auctions can be

20 used for single items such as a work of art and for multiple units of a homogeneous item

such as gold or securities. Auctions are useful in circumstances when the goods do not

have a fixed or determined market value, and therefore the seller is unsure of the price he can get.

There are different ways to classify auctions. There are open auctions as well as sealed-bid auctions. There are auctions where the price ascends and auctions where the price drops at regular intervals. William Vickrey, winner of the 1996 Nobel Prize in Economic Sciences, established the basic organization of auctions based upon the order in which prices are quoted and the manner in which bids are tendered. He established, and generally other experts agree, that there are four major one-sided auction types: English (discriminatory open ascending first-price), Dutch (discriminatory open descending first-price), Sealed-Bid (discriminatory closed first-price), and Vickrey (uniform second-price). One-sided auctions are defined as having one seller and multiple buyers, or one buyer and multiple sellers. This is in contrast to two-sided auctions which have multiple buyers and sellers, such as at the New York Stock Exchange. One difficulty is the lack of commonality in auction naming conventions. The naming convention just listed from the academic literature is not followed in the financial and commercial communities wherein the uniform second-price, or Vickrey auction, is sometimes known as a Dutch auction. Similarly, the Sealed-Bid auction is sometimes called an English auction in the financial community and a Yankee auction in Great Britain. In this disclosure, the academic convention will be followed.

The term "Discriminatory" is sometimes used to describe an auction wherein multiple identical items are offered. In a Discriminatory auction, the winning bidders each pay what they bid, which will almost always be different from what the other

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bidders bid. So the winners will each have purchased identical items at different prices. The term "First-Price" is an academic term that means that each bidder pays what he or she bids. First-Price auctions of multiple identical items are always Discriminatory. The term "Second-Price" is an academic term that means that each bidder will pay what a

5 lower bidder bid (the second lowest bidder in the case of auctions of a single unique item).

There are drawbacks to some auction types. The "Winner's Curse" is recognized as the phenomenon that occurs when the winner in a First-Price auction pays more for an item than the other bidders think it is worth. In auctions wherein no bidder is sure of the

10 worth of the item being auctioned, the winner is the bidder who made the highest guess. If bidders have reasonable information about the worth of the item, then the average of all the guesses is likely to be correct. The winner, however, offered the bid furthest from the actual value (the highest bid). Auction winners are faced with the sudden realization that their valuation of an object is higher than that of anyone else.

15 The English auction, also known as the open-outcry auction or discriminatory open ascending first-price auction, is used commonly to sell art, wine, cattle and numerous other goods. In the English auction, the auctioneer begins with a low price and proceeds to solicit successively higher bids from the bidders until no one will increase their bid. The item is sold to the highest bidder. One drawback of the English auction is

20 "rings," i.e. subsets of bidders who have banded together by agreeing not to outbid each other in order to keep the winning bid as low as possible. A further drawback of the English auction is that the bidder usually forces the bid up by one small step at a time.

Often a successful bidder acquires an object for considerably less than his maximum valuation simply because he need only increase each bid by a small increment. In other words, the seller does not necessarily receive maximum value, and, from the seller's perspective, other auction types may be superior to the English auction. From the bidder's perspective, one disadvantage of the English auction is that the Winner's Curse is widespread because inexperienced participants may bid up the price. Another disadvantage to the English system is that a buyer or his or her representative must be present which may be difficult and/or expensive.

The discriminatory descending open first-price auction is the technique used in the Netherlands to auction produce and flowers, and is therefore known in academic literature as the Dutch auction. The Dutch auction uses an open format rather than a sealed-bid method. Bidding starts at an extremely high price and is progressively lowered until a buyer claims an item by calling "mine," or by pressing a button that stops an automatic clock. When multiple units are auctioned, additional bidders press the button as price further declines. In other words, the first winner takes his prize and pays his price, with later winners paying less. When the goods are exhausted, the bidding is over.

The Dutch auction does have at least one advantage over the English auction from the seller's perspective. In an English auction, the underbidder usually forces the bid up by one small step. The winner may end up paying well under his valuation and thus the seller does not receive the maximum price. In the Dutch system, if the bidder with the highest interest really wants an item, he cannot afford to wait too long to enter his bid. That means he might bid at or near his highest valuation.

The Sealed-Bid auction has a primary characteristic of being sealed (not open-outcry like the English or Dutch varieties) and each bidder is unaware of the bids from other bidders. A winning bidder pays exactly the amount he bid. Usually, (but not always) each participant is allowed one bid, which means that bid preparation is especially important. In general, a Sealed-Bid auction has two distinct parts: a bidding period in which participants submit their bids, and a resolution phase in which the bids are opened and the winner determined. In this method, bidders may suffer from the Winner's Curse. Sealed-Bid auctions are commonly used by the United States government to auction offshore oil and gas leases.

The uniform second-price auction is commonly called the Vickrey auction, named after the previously mentioned William Vickrey. Like the Sealed-Bid auction, the bids are sealed, and each bidder is unaware of the amount of the other bids. The winner is determined by identifying the highest bid. However, the bidder does not pay what he or she bid, rather the bidder pays the amount in the second highest bid. If, for example, bidder A bids $10, bidder B bids $15, and bidder C offers $20, bidder C would win, however he would only pay the price of the second-highest bid, which is $15. When auctioning multiple units, all winning bidders pay for the items at the same price, which is the lowest winning price. The United States Treasury Department uses a Vickrey (called Dutch) auction to sell 90-day T-Bills. Several other examples of a Vickrey auction of multiple items are described below.

It seems that a seller would make more money by using a first-price auction, but that has been proven to be untrue. Bidders understand the rules and modify their bids as

circumstances dictate. In the case of a Vickrey auction, bidders adjust upward. No one is

deterred out of fear that he will pay too high a price. Aggressive bidders receive sure and

certain awards but pay a price closer to market consensus. The price that the winning

bidder pays is determined by competitors' bids alone. Less underbidding occurs because

5 the bidders do not fear of suffering from the Winner's Curse.

Another example of a Vickrey auction of multiple identical items is the auctioning

of shares in an initial public offering "IPO." This specific example is referenced at the

Cyberinvest.com website: ~~www.cyberinvest.com/glossary/dutchauction.html~~ cyberinvest.com/glossary/dutchauction.html. Since this

is a site used primarily by the financial community, the term Dutch auction is used rather

10 than the academic term, Vickrey auction. As set out in the glossary referenced, "The

(Dutch) auction is conducted by secret bid, with all successful bidders (those bidding

higher than the accepted price) getting the opportunity to buy shares at the accepted price.

Those bidding at exactly the winning price get a percentage of any leftover shares."

There are numerous patents relating to hosting auction sites using the Internet and

15 world wide web as a networked computer environment in a computerized system of

commerce. A few specific examples are United States Patents Nos.4,903,201, to Wagner;

5,845,265 ~~5,545,265~~ to Woolston et al; 5,794,207 to Walker et al; 5,835,896 to Fisher, et al;

5,895,454, to Harrington; 5,905,975 to Ausubel; and 5,924,082 to Silverman et al.

4,903,201, to Wagner matches buyers and sellers in an exchange driven

20 commerce system such as NASDAQ or the New York Stock Exchange by offering an

efficient marketplace that favors neither buyers nor sellers. The automated exchange

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driven commerce system for futures disclosed in the '201 patent describes effective communications that allow for the matching process to take place.

5,545,265 to Woolston et al describes a method and apparatus for offering used and collectible goods for sale over an electronic network of consignment stores. The method presents a record of sale goods to a market for the goods over a wide area communication network for presenting the goods to a purchaser. Woolston '265 describes the use of a plurality of posting terminals and a market maker computer in a framework that establishes a bailee relationship and consignment contract with a purchaser of a good at the market maker computer that allows the purchaser to change the price of the good once the purchaser has purchased the good thereby to allow the purchaser to speculate on the price of collectibles in an electronic market for used goods while assuring the physical possession of a good with a vetted bailee.

5,794,207 to Walker et al teaches a method and apparatus for effectuating bilateral buyer-driven commerce, allowing prospective buyers of goods and services to communicate a binding purchase offer globally to potential sellers, for sellers conveniently to search for relevant buyer purchase offers, and for sellers potentially to bind a buyer to a contract based on the buyer's purchase offer. The Walker disclosure provides apparatus controller which receives binding purchase offers from prospective buyers. The controller makes purchase offers available globally to potential sellers. Potential sellers then have the option to accept a purchase offer and thus bind the corresponding buyer to a contract. The method and apparatus contemplates applications on the Internet as well as conventional communications systems such as voice telephony.

5,835,896 to Fisher concerns a system and method for conducting a multi-person, interactive auction, in a variety of formats, without using a human auctioneer to conduct the auction. The system is preferably implemented in software. The system allows a group of bidders to interactively place bids over a computer or communications network.

5 Those bids are recorded by the system and the bidders are updated with the current auction status information. When appropriate, the system closes the auction from further bidding and notifies the winning bidders and losers as to the auction outcome.

5,895,454, to Harrington describes a method of effecting commerce in a networked computer environment in a computerized system. A database of vendor product data and an associated database interface is established on a first computer. The interface allows remote access by one or more user(s). A local user interacts with the database by querying the database to specify a local user's product/service specification. The database provides the local user with a selection of remote vendor network sites, where the selection is determined on the basis of the user querying the database. After the local user interactively connects with one or more of the remote vendor network sites, the user selects products/services from the information provided on the remote vendor network site. The selection of a particular product/service triggers a transaction notification which records the user's selection and associated financial transaction data which is transmitted to the database and associated database interface. The local user may connect to subsequent remote vendor network sites, and each selection of a product/service also triggers a transaction notification which is transmitted to the database. The database and associated database interface provides information relating to

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the user's realtime selection of products/services. During or at the conclusion of a local

user's shopping session, the user confirms the selection(s) whereby the database and

associated database interface transmits purchase/ordering data to the remote vendor sites

corresponding to the user's selection.

5   5,905,975 to Ausubel relates to computer implemented methods and apparatus for

auctions. The system has at least two intelligent systems, one for the auctioneer and at

least one for a user. The auction is conducted by the auctioneer's system communications

with the user system(s). The auctioneer's system contains information from the user

system(s) based on bid information entered by the user(s). With this information

10   auctioneer's system determines whether the auction can be concluded or not and

appropriate messages are transmitted to the user(s).

5,924,082 to Silverman et al discloses a negotiated matching system including a

matching station, remote terminals associated with respective potential counter parties, a

communications network for permitting communication between the remote terminals,

15   and the matching station. Each user enters trading information and ranking information

into his or her remote terminal. The matching station then uses the trading and ranking

information from each user to identify transactions between counter parties that are

mutually acceptable based on the ranking information, thereby matching potential counter

parties to a transaction. Once a match occurs, the potential counter parties transmit

20   negotiating messages to negotiate some or all terms of the transaction. Thus, the

negotiated matching system first matches potential counter parties who are acceptable to

each other based on trading and ranking information, and then enables the two counter-

parties to negotiate and finalize the terms of a transaction.

It is apparent that there is a wide knowledge base and considerable expertise in the

art for using a communications network to connect a computer system with a data base of

5   items or goods for sale with potential buyers using remote terminals. The patents relating

to using the Internet and world wide web as a networked computer environment in a

computerized system of commerce described above (United States Patents Nos.

4,903,201; 5,545,265; 5,794,207; 5,835,896; 5,895,454; 5,905,975; and 5,924,082) are

each hereby specifically incorporated by reference.

10   There are also Internet sites that support uniform second-price auctions (Vickrey

auctions). WR Hambrecht + Co offers one example of such at ~~www.openipo.com~~ *openipo.com* and

more specifically, ~~www.openipo.com/offerings/auctions/openipo/index.html~~ *openipo.com/offerings/auctions/openipo/index.html*. As

described by WR Hambrect,

> "Open IPO is a new way to take companies public that opens up
> access to IPOs. Based on a Dutch auction system designed by Nobel Prize-
> winning economist William Vickrey, Open IPO uses a mathematical
> model that treats a bid from an individual the same as a bid from a large
> institution. This means Open IPO offering prices are set by the market.
> The result is a price that reflects what people are truly willing to pay for
> the stock and the likely allocation of shares to long-term investors rather
> than speculators.
> As in a typical auction, the highest bidders win. But there are two
> important differences. In the Open IPO auction, bidding is completely
> secret, and winning bidders all pay the same price--the amount of the
> lowest bid at which the deal can be completed."

Vickrey auctions have been used in settings where bidders have interdependent

values and for multiple identical items with interdependent values. It has also been

shown that in multiple unit auctions with variable supply in a uniform-price auction the seller can eliminate low-price equilibria by restricting supply after the bids are in. The effects of variable supply on seller revenues in both uniform-price and pay-your-bid auctions have also been considered. None of the above-described auction methods or patents disclose a seller-defined method within a commercial network system that allows the seller to maximize revenue and/or profit. Further, since the first documented occurrence of auctions in 500 B.C., auctions have been used as a method of allocating scarce resources. That is, auctions have been used when there is insufficient supply of a resource to satisfy every potential buyer's demand. Since not every buyer can be satisfied, competition among buyers drives up the price received by the seller. The method and apparatus of the present invention is the first method to allow the auctioning of non-scarce (plentiful) resources. Some examples of such plentiful resources would be: manufacturing overruns, remaindered books, and excess power generation capacity. This method is also the first method to allow the auctioning of infinite resources. Some examples of such infinite resources would be: a license to use software, the right to play or use a piece of music, or a ticket to view a movie, and other intellectual property rights. None of the prior auction methods is appropriately applied to situations where the goods to be auctioned are non-scarce, or even of infinite supply. Accordingly, there is a need for the present inventions' form of Vickrey auction with a market-derived reserve price.

20 **SUMMARY OF THE INVENTION**

The method and apparatus of the present invention provides an auction method and a method for using a computer system and communications network to connect the

computer containing a data base of items or goods for sale with potential buyers of the goods, and to facilitate a transaction between a seller and at least one buyer, or a buyer and at least one seller.

The Maudlin - Vickrey Auction is a method that allows the seller to optimize revenue over the existing Vickrey auction method. It allows bidders to submit bids at market-clearing prices in addition to bids at specific prices. A market-clearing, or "At Market," bid is a bid with an unspecified price which indicates that the bidder will purchase a particular quantity at the same price that the winning bidders who bid a specific price will pay. The method allows sellers to select the preferred quantity to be sold if more than one quantity yields the same revenue. It allows bidders to submit bids that are pro-ratable.

The Maudlin - Vickrey Auction is a method that allows the seller to optimize net profit (revenue less production and disposal costs) in addition to optimizing revenue. It allows bidders to submit bids at market-clearing prices in addition to bids at specific prices. It allows sellers to select the preferred quantity to be sold if more than one quantity yields the same net profit. It allows bidders to submit bids that are pro-ratable.

The Maudlin - Vickrey Auction is a method that allows the auctioning of items when the supply or quantity of items available for sale exceeds the total quantity bid. It allows bidders to submit bids at market-clearing prices in addition to bids at specific prices. It allows sellers to select the preferred quantity sold if more than one quantity yields the same net profit. It allows bidders to submit bids that are pro-ratable.

The Maudlin - Vickrey Auction is a method that allows the auctioning of items when the supply available for sale is infinite. It allows bidders to submit bids at market-clearing prices in addition to bids at specific prices. It allows sellers to select the preferred quantity sold if more than one quantity yields the same net profit. It allows bidders to submit bids that are pro-ratable.

The Maudlin - Vickrey Auction is a method that allows the seller to determine the optimum quantity to be offered for sale.

The method and apparatus maximizes revenue and/or profit by withholding supply in Vickrey auctions based on a market-derived reserve price calculated from the bids. The following is a simplified outline of the steps of the method.

In a first step of the method of the present invention, a seller has to submit a sales offer for at least one item to be sold. The seller's sales offer shall not include any price information of the items to be sold. Thereafter, at least one buyer that is interested in buying these items has to submit at least one bid (purchase offer), with each bid containing a bid price and a respective bid quantity, i.e. the quantity of items he wants to buy.

In a second step, the submitted bids are sorted from high to low, based upon the respective bid prices to generate a sequence of bid elements. Each element contains a bid price, a respective bid quantity, and a cumulative bid quantity that is the sum of the bid quantity of this respective bid element and the bid quantities of all the previous bid elements. That is, the first element contains the highest bid price, the respective bid quantity and a bid amount which is equal to the bid quantity. The second element

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contains the second highest bid price, the respective bid quantity and a bid amount which is the sum of the first element's bid quantity and the second element's bid quantity The third element contains the third highest bid price, the respective bid quantity and a bid amount which is the sum of the third element's bid quantity, the second element's bid quantity and the first element's bid quantity, etc.

In a third step, in each element of the previously generated sequence, the cumulative bid quantity is multiplied by the respective bid price to calculate a sequence of bid revenues. The costs from production, sale of the items and the cost of disposal of the cumulative unsold items are deducted from the bid revenues to calculate bid profits. As many variables as desired could be included in such cost functions to fine tune the ability to maximize profit.

In a fourth step, from this new sequence of bid revenues and/or profits, the highest revenue and/or profit is selected and the corresponding bid price becomes the sales price. All bids At Market or that are greater than or equal to the sales price, are accepted and every winning bidder pays the same price, which is the sales price.

Those skilled in the art will readily recognize that although these examples are based on a single seller and multiple buyers, a reverse auction, with a single buyer and multiple sellers, can be performed with this method. A reverse auction would encompass the situations of withholding demand to minimize cost to the buyer.

These and other features and advantages will be more clearly understood from the following detailed description viewed in conjunction with the accompanying drawings. It

is important to note that the drawings are illustrative and are not intended to represent the only form of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows a flow chart outlining the process of sorting SUBMITTED_BIDS into SORTED_BIDS.

Figure 2 shows a flow chart of an outline for the step of processing SORTED_BIDS into CONSOLIDATED_BIDS.

Figure 3 shows a flow chart for the first stage of the iterative step of processing CONSOLIDATED_BIDS.

Figure 3B shows a flow chart for the second stage of the iterative step of processing CONSOLIDATED_BIDS.

Figure 4 shows a flow chart for steps of processing SUBMITTED_BIDS into a BID-STATUS file.

Figure 5 shows an exemplary list of bids from several bidders.

Figure 6 shows a table of the bids in FIGURE 5 sorted from high to low which will be used to determine the selling price for the items.

DETAILED DESCRIPTION OF THE INVENTION

For a more complete understanding of the present invention, and the advantages thereof, reference is now made to the following description and tables taken in conjunction with the accompanying drawings. In the following description, well-known elements within the skills of persons of ordinary skill in the relevant art are presented without detailed description in order not to obscure the present invention in unnecessary

detail. In a preferred embodiment the apparatus of the present invention includes a microprocessor for storing data and performing iterative calculations. The data stored comprises a listing of items or goods for sale by auction and parameters selected by the seller or sellers determining the ground rules of the sale. The apparatus further includes a communications network for connecting the data base with potential buyers. The method and apparatus of the present invention have applications on the Internet as well as conventional communications systems.

Referring now to Figures 1-4 and Table 1 listed below, to begin the method of holding a Vickrey auction optimized by the method of the current invention, the seller states: the item(s) being offered, the procedure for submitting (and withdrawing) bids (including any contractual arrangements that must be made in order for the bids to be binding), delivery requirements (when and where successful bidders should pick up items), whether bids may withdrawn prior to the close of the auction, and the closing date and time of the auction. The seller also decides: whether "at market" bids will be accepted, whether there is an announced (publicly known) reserve price, and if so, what it is, whether bids should have a minimum quantity, and if so, what it is, whether bids should have a maximum quantity, and if so, what it is, and whether to announce the quantity available for sale.

As part of the method of establishing the rules of the auction, the seller determines: the cost profile for production or sale of items and cost of disposal of unsold items, any allocation policy, including prorationing, among multiple bids at selling price, and whether there will be an unannounced reserve price, and if so, what it is. The seller

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must also decide, in the event more than one price yields the same profit, whether to sell

the minimum quantity that will yield that profit, the maximum quantity that will yield

that profit, or whether the winning price will be decided outside the process. This

decision may be made necessary by situations where more than one price yields the same

5   profit. An example of a decision controlled "outside the process" would be to base the

selection on the number of units allowed to be sold on a desire to build market share

rather than premium brand identification. In such a case the greater number of goods

would be selected.

Table 1 - Seller Data Definitions

10   Seller Data

AMOK	will "at market" bids accepted	0=no 1=yes
PUBRESOK	is there a publicly posted reserve price	0=no 1=yes
PUBRES	publicly posted reserve price	
MINQTY	minimum bid quantity	0=no minimum bid quantity
MAXQTYOK	is there a maximum bid quantity	0=no 1=yes
MAXQTY	maximum bid quantity	
SUPPLY	total quantity available for sale	
PRIVRESOK	is there a private reserve price	0=no 1=yes
PRIVRES	private reserve price	
MNMXFLAG	when more than one price yields the same profit, should the minimum quantity be sold or the maximum	0=minimum, 1=maximum
COST(Q)	what is the cost of producing or selling Q items plus the cost of disposing of SUPPLY-Q items	

15 ... MINQTY line; 20 ... MAXQTY line; 25 ... MNMXFLAG line; 30 ... COST(Q) line.

The seller announces the auction by publicly disclosing the information set out above and provides for collecting bids received and inputting both the auction parameters selected and bids received into a microprocessor capable of iterative calculations.

Referring now to Figures 1-4 and Table 2 set out below, bids are collected as bidders submit bids according to the procedures the seller established until the auction close. If bids may be withdrawn, bidders submit bid withdrawals until the auction close. Bidders may submit multiple bids and have multiple non-withdrawn bids outstanding at the auction close. Bids must contain the following information: identity of the bidder, quantity bid for, price (or at market), whether bidder will accept partial quantity or will only accept full quantity.

Table 2 Bidder Data Definitions

Bidder Data

SUBMITTED_BIDS		
SORTED_BIDS		
BIDID	predetermined code that uniquely identifies the bidder	
BIDQTY	quantity bid for	
BIDATMKT	is this bid "at market"	0=no, 1=yes
BIDPRICE	price bid	
BIDPRO	will the bidder accept a partial (prorated) quantity	0=no, 1=yes

Referring now to Figures 1-4 and Table 3 set out below, after the auction close or as each bid is received until the auction close (at the Seller's option), bids not conforming the auction requirements are rejected. After action close, all non-rejected bids are entered into the SUBMITTED_BIDS file using all the data defined in Table 2.

The next step to the method of the present invention is to process the

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SUBMITTED_BIDS file into SORTED_BIDS file using the steps of the procedure set out in Figure 1. SORTED_BIDS uses the same structure as SUBMITTED_BIDS, see Table 2.

Following the step of processing the SUBMITTED_BIDS file into

5   SORTED_BIDS file, the data is next processed to convert the SORTED_BIDS file into the CONSOLIDATED_BIDS file using the steps of the procedure set out in Figure 2. CONSOLIDATED_BIDS Data Definitions are given in Table 3 below.

Table 3 Data Definitions

CONSOLIDATED_BIDS Data

10   CONATMKT   are these bids "at market"   0=no, 1=yes
       CONPRICE   price bid
       CONQTY   quantity bid

The next step of the method of the present invention is to process the CONSOLIDATED_BIDS file to determine the selling price, if any, using the steps of

15   the procedure illustrated in Figures 3A and 3B. Table 4 below sets out illustrative Intermediate Result Data Definitions.

Table 4 Intermediate Result Data Definitions

Intermediate Results Data

       PRICE   winning bid price
20   AFLAG   allocation status flag   0=no bids accepted
                                                 1=all bids at and above PRICE
                                                 are accepted
                                                 2 or more = Set according to
                                                 Seller's established allocating
25   procedure
       NHIGH   number of price points that generate the maximum profit

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The next step of the method of the present invention is to process the SUBMITTED_BIDS file into BID_STATUS file using the steps of the procedure illustrated in Figure 4. Table 5 below sets out BID_STATUS Data Definitions.

Table 5 BID_STATUS Data Definitions

BID_STATUS Data

BIDID	predetermined code that uniquely identifies the bidder
AWARDQTY	quantity awarded

The final steps in the method of the present invention are to notify bidders of whether they won or lost using the information in the BID_STATUS file.

With the above detailed description and Figures 1-4 in mind, a brief and simplistic example of the process and method of the present invention will be given, with reference to the additional Figures 5 and 6. As one can see from Figure 5, several bidders have submitted their bids. The bids contain different bid prices and different bid quantities. For example bid No.1 contains a bid quantity of 100 items and a bid price of $ 7200 per item, i.e. the buyer has interest to buy 100 items and does not want to pay more than $ 7200 for one item. Bid No. 2 contains a bid quantity of 100 items and a bid price of $ 6800 per item, i.e. the buyer has interest to buy 100 items and does not want to pay more than $6800 for one item.

Figure 6 presents a table with four columns. The first column contains the bid prices for the respective bids sorted from high to low. The second column contains the bid quantities for the respective bids. The third column contains a sequence of the

cumulated bid amounts. As one can see from Figure 6, the first line of the table lists bid

No. 7 in Figure 5. Thus, the first element of the first column is the highest bid price of

$10000, the first element of the second column is the bid quantity (300 items) that

belongs to this bid price, the first element of the third column is a bid amount that is

equal to the bid quantity of the highest bid quantity of 300 items. The first element of the

fourth column is the revenue of the highest bid, i.e. the result of a multiplication of the

highest bid price of $ 10000 (first element of the first column) and the respective bid

amount of 300 items. The second line of the table lists bid No. 11 in Figure 5. Thus, the

second element of the first column is the second highest bid price of $9600, the second

element of the second column is the bid quantity (100 items) that belongs to this bid

price, the second element of the third column is a bid amount that is the sum (400 items)

of the respective bid quantity of 100 items and the highest bid quantity of 300 items. The

second element of the fourth column is the revenue of the second highest bid, i.e. the

result of a multiplication of the second highest bid price of $ 9600 (second element of the

first column) and the respective bid amount of 400 items. The table set out in Figure 6

therefore lists the ranking of bids and the result of the calculations. It is apparent that

revenue is maximized at the price of $5600.00, and that the number of units sold at that

price is 1400 for a total revenue of $7,840,000.00.

Although these examples and illustrations above are based on a single seller and

multiple buyers, a reverse auction, with a single buyer and multiple sellers, can be

performed with this method. A reverse auction would encompass the situations of

withholding demand to minimize cost to the buyer. Although there are several

techniques for converting the methodology of an auction to a reverse auction, the simplest

is to reverse the sign of the bids (make them negative) and to use the same process

outlined above. An example of a reverse auction is a company stock buy-back program.

As to the manner of operation and use of the present invention, the same is made

5 apparent from the foregoing discussion. With respect to the above description, it is to be

realized that although an enabling embodiment is disclosed, the enabling embodiment is

illustrative, and the optimum relationships for the steps of the invention and calculations

are to include variations in size, material, shape, form, function and manner of operation,

assembly and use, which are deemed readily apparent to one skilled in the art in view of

10 this disclosure, and all equivalent relationships to those illustrated in the drawings and

encompassed in the specifications are intended to be encompassed by the present

invention.

Therefore, the foregoing is considered as illustrative of the principles of

the invention and since numerous modifications will readily occur to those skilled in the

15 art, it is not desired to limit the invention to the exact construction and operation shown

or described, and all suitable modifications and equivalents may be resorted to, falling

within the scope of the invention.

What is claimed as being new and desired to be protected by letters patent

is as follows: